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Evaluation Report:
Medical College of Georgia 3-West Critical Care Unit

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MCG Health System

Georgia Tech College of Architecture

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Overview

This report is the product of a joint research project between the Medical College of Georgia, MCG Health, Inc., and the College of Architecture, Georgia Institute of Technology. The purpose of this project was to evaluate the $995,000 renovation of the 20-bed 3-West Wing at the Medical College of Georgia Medical Center, which opened in 2003. Through direct observation, focus-group interviews, comparisons with other facilities (benchmarking), and examination of the research literature, investigators were asked to provide evidence-based conclusions about the effectiveness of the new unit design. The research focused on two general questions: (1) how well does the design of the new unit allow families to establish regular patterns of life and support critically-ill patients, and (2) how well does the design allow nursing staff to communicate and work together while increasing time spent at the bedside? The investigators found that the general decisions made in the design process have resulted in a unit that with which family members and staff are well pleased. However, the investigation revealed a number of possible small changes, which, if implemented, may further increase patient and staff satisfaction.

Background

In 2003, the Medical College of Georgia and MCG Health, Inc. embarked on a $995,000 renovation of the 3-West Wing at the Medical College of Georgia Hospital. The renovated 6,500 square-foot wing contains ten universal beds, capable of being used for critically-ill patients as well as general patients, and ten general floor beds; the project cost was approximately $153 per square foot. The unit is used by 38 nurses, some of whom provide care for patients in either the general unit, or the critical unit.

Although investigators were interested in the unit as a whole, the study focused on several distinct areas of the 3-West Unit design: patient rooms, the common family area, the central nurses' station, and the distributed nursing substations (or "pods").

Research Method

A research team from Georgia Tech's College of Architecture worked under the supervision of Dr. Craig Zimring in order to determine if evidence could be found to support the design decisions that were implemented in the 3-West Project. To complete their investigation, team members first evaluated the current research literature, determining which studies were applicable to the 3-West project. Research team members then spent several days on the floor making direct observations in the unit, tracking five nurses and recording their location, activities, and the duration of their activities over a total of 24 hours. Researchers also completed a behavior mapping study

in which they recorded the location of and interaction between patients, visitors and staff at 30 minute intervals over pre-arranged path segments.

To gain information from project stakeholders, researchers conducted two focus group interviews: the first, a "family focus group" was comprised of one patient, one patient advocate and four family members; the second, the "nurse focus group" was comprised of five nurses. In these interviews, members of the family focus group were asked to describe their overall impression of the design, as well as their feelings about the patient rooms, the family areas in the patient rooms, and the common family area. Members of the nurse focus group were asked about their overall impression of the design, as well as the effectiveness of the central nurses' station, the distributed nursing substations, and the support areas. Members of the nurse focus group were also asked about the impact of family members being present in patient rooms. Both groups were asked how the design affected their communication with staff/other staff members, and what improvements could be made to the design.

In order to provide a reliable measure of how the 3-West Project compared to other facilities around the United States, the researchers performed a Benchmark Evaluation, comparing the size of areas given over to patient rooms, nurses' stations, distributed nursing stations, support areas, family areas and circulation areas in a number of other facilities.[1]

Over the course of the investigation, researchers also conducted less formal interviews when presented with opportunities to talk with both staff and family members.

Family Concerns

The presence of a loved one in a critical care unit is an extremely stressful event for members of the patient's family. While design decisions cannot eliminate the stress caused by such an event, the physical surroundings should certainly not increase the family's stress, and intelligent design decisions may be able to reduce that stress.

During this investigation, several types of needs for family members (or visitors) were identified which may be supported by the physical environment. These need categories include:

1. Comfort
2. Proximity to Patient
3. Privacy
4. Environmental Control
5. Access to Information

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[1] These facilities were: St. Luke's Medical Center, Milwaukee, WI; Christian Hospital Northeast, St. Louis, MO; Stormont-Vail Regional Medical Center, Topeka, KS, St. Joseph Health Center, Kansas City, MO; Sacred Heart Medical Center, Spokane, WA; and Bristol Hospital, Bristol, CT. ; Legacy Good Samaritan, Portland OR; St. Elizabeth Community Health Center, Lincoln, Nebraska; Loma Linda University Medical Center, Loma Linda, CA; Mayo Medical Center , Rochester, Minnesota; Washington Adventist Hospital, Takoma Park, MD; Rochestor General Hospital, Rochester, NY; Clarian Health Group – Methodist Hospital of Indiana, Indianapolis, Indiana

Staff Concerns

Although they operate in such environments daily, staff members and caregivers are not immune to the stress and frustration of a critical care unit. Such concerns go beyond the welfare of staff members, however; previous studies have shown that increased stress can lead to mistakes which have serious health-care and financial impacts. During this study, there were four categories of staff needs identified which may be supported by the physical environment:

1. Environmental Support
2. Proximity to Patient
3. Communication and Collaboration
4. Rest and Relaxation

The remainder of this report discusses how each of these concerns (both for family and staff) is affected by the design decisions made in the four areas of interest: patient rooms, the common family waiting area, the central nursing station and the distributed nursing substations. An additional section is devoted to larger, more conceptual design issues in the unit.

Patient Rooms

One of the most obvious design choices in the 3-West Project was the decision to provide a place for the patient's family to stay in the patient's room at any time, day or night. In the current design, 30% of the patient room, (94 square feet) is designated as a family zone. While the zone is not designated by any physical attributes, such as differences in floor or wall finishes, the layout of the room means that caregivers attending to patients have little need to impinge on the family zone. The size of the patient rooms is also significant. At an average size of 330 square feet, the rooms are significantly larger than the mean 258 square foot size of patient rooms in comparable hospitals.

These design choices were made for several reasons: the rooms were previously semi-private rooms, but research evidence demonstrates that single-patient (i.e., private) rooms are correlated with reduced nosocomial infection rates, so the rooms were converted to single-patient rooms, and; the design team believed that having family stay in the room with the patient would allow for greater family involvement in the care process and a reduced sense of stress in an obviously stressful situation. Designers also hoped that this design would allow families some personal space, and the ability to store items and belongings—options that are not available in typical shared family area-only designs.

The reaction to these decisions has been overwhelmingly positive. Researchers heard significant praise for the design in the family focus group interview: "I like everything here" and "I can stay near him [the patient] and everyone welcomes family," were typical sentiments in the family focus group. The nursing staff was also in favor of the design change. One nurse said: "Having family [in the room] cuts down on the anger of the patient and other family members."

Observational data confirmed that patients' family members spent a considerable amount of time in the patient room. During the behavior mapping portion of the study,

researchers were able to conclude that family members were present in patient rooms at least 22% of the time. However, this number may have been even higher because observers were not able to reliably determine if family members were sleeping in darkened patient rooms at night.

Another key feature of the design included the location of highly visible and easily accessible handwashing stations in patient rooms. Previous research has shown that increasing handwashing rates in one hospital from 48% to 66% lead to a reduction in methicillin resistant *Staphylococcus aureus* incidents from 2.16 to .96 per 10,000 patient days (Pittett, et al., 2000).

While the overall design choices of the patient room appear to be successful, researchers noted several considerations for improvement. Most of these changes are comparatively small in scope, and could be completed without incurring much cost or inconvenience.

First, researchers noted that the current design does not do enough to shield family members from the light and sound that may be present in patient rooms—especially during procedures that are performed at night. Researchers once observed a family member move into the hallway for sleep when a procedure was being performed on a patient late at night. Increased noise and light insulation, either through a curtain, or a more permanent structure, might help reduce these problems.

Researchers also noted that an increase in storage spaces would give family members with needed places to keep their belongings and improve their ability to have a more "normal" existence. While the family members have a closet to store belongings in the patient room, they currently lack space to place items that they are currently using, such as CD players, food and drink, or books. Sometimes, family members who are trying to store items off of the floor have to resort to infringing on ambiguously-owned space on top of the counter underneath the window. An increase in writing and storage space would also help staff, who, researchers observed, often seem to lack adequate work surfaces. Currently, the food-table that slides over the bed of the patient is often filled with nurses' paperwork, and in some cases, researchers observed that the lack of work surfaces caused staff to resort to writing on the lids of trash bins—an obvious sanitary concern. However, an increase in work surfaces, possibly in the form of tables that fold-down from the wall, should not be a difficult addition.

Family members and nurses also had several small suggestions for future designs. Family members felt that televisions were mounted too high and at an odd angle from the family zone for comfortable viewing, and that the recliners placed in the rooms were not as comfortable as they would like. Family members also requested the option of earphones or headsets so that they could listen to the television without disturbing the patient. Nurses felt that rooms should have separate telephones for family use and that guidelines for members of the patient's family should be printed in larger type, and placed more noticeably around the unit. Nurses also wanted patient room to include a power column,

which would prevent them from having to move patients (a process that incurs inconvenience and increases the potential for harmful and costly falls).

Finally, previous research has indicated that views of nature can play a significant role in shortening patient stays, improving patient outcomes, and lowering the use of self-administered analgesics by patients (Ulrich, 1984). Unfortunately, the overall design of the Medical College of Georgia Hospital means that patient rooms in the 3-West wing look over the roof of an adjacent portion of the hospital. While the view is not necessarily a bad one, it might be better. As future areas of the hospital are renovated, special consideration should be given to maximizing views of nature.

Common Family Area

The common family waiting area exists to serve a larger number of people than could possibly fit in an individual patient room. Only three visitors are allowed in the patient room at any one time. The shared family area is also meant to provide a place for family members to go to escape the stress of the patient room.

The percentage of the unit given over to the family area in the 3-West wing was just over 5% (if considering only the critical care portion of the unit). While this percentage is lower than the 7.5% of floor space found across all of the hospitals analyzed during this study, the average is somewhat inflated by the case of Legacy Good Samaritan Hospital in Portland Oregon which had a large outdoor space that was counted as a family area.

In meeting the goals outlined above, the common family waiting area received mixed reviews. Conceptually, the space is appreciated by family members, and behavioral mapping indicated that a large number of family members used the space. However, as with many waiting areas, a small child or a loud television has the possibility to dominate the room, a comment that was raised in several of the interviews. Family members also mentioned that it would be nice to have small consultation rooms located outside of the patient room where they could go to cry or discuss medical operations outside of patients' hearing. The concept of a multiple-zoned common area, including a quiet area and small consulting rooms has been implemented at St. Joseph's Health Center's Medical Surgical Cardio-ICU, in Kansas City, MO, and may be a useful model for future designs. Researchers noted that there were few opportunities for family members to sit outside of the unit; the addition of some outdoor gardens or other outdoor seating might provide another useful common area.

Interviews with family members also indicated that some amenities, including a refrigerator, icemaker, microwave, vending machines, and a washer and dryer, would be conducive to leading a more normal life while loved ones were in the hospital.

An additional observation made by the research team is that the entrance to the family area is confusing for some visitors. Many visitors believe that the open-glass wall of the visitor area is the entrance to the unit rather than the less-intuitive closed doors that tend to conceal the entrance to the unit. This confusion presumably increases stress among visitors to the unit, however, it has a monetary cost as well: one study has shown that the

act of giving directions by people other than information staff in an Atlanta-area hospital cost 4,500 staff hours, or $220,000.00 per year (Zimring, 1990). A small investment in signage could help solve this potentially confusing layout.

Central Nurses' Station

Another critical design decision in the 3-West Wing design was the use of a central nurses' station with smaller, distributed substations located outside of patients' rooms. For the most part, the central station is used by the nurses working the non-ICU portion of the floor, while the ICU nurses use the substations almost exclusively. One of the best traits of the central nurses' station is the openness and clear visibility throughout the area. Areas of the nurses' station are designed to support individual work as well as collaborative group work. Researchers noted that there were very few spatial impediments to either type of work. However, during the behavior tracking portion of the study, researchers found that the large size of the nurses' station resulted in some areas being underutilized. Researchers also noted that in several situations, especially when procedures were going on in adjoining rooms, the counter space of the central nurses' station was quickly filled. Again, increasing counter space may help streamline workflow.

Researchers observed that the lighting levels in the central nurses' station (ranging from 15 to 133 lux) fell below those recommended in the Illuminating Engineering Society of North America's Handbook for offices with computer screens (538 lux). Previous research has shown that the introduction of brighter task lighting (moving from 450 lux to 1500 lux) reduced pharmaceutical prescription dispensing errors from 3.8% to 2.8% (Burchanan, et al., 1991). An increase in the brightness of overhead lighting, or an increase in task lighting may help reduce errors in the central nurses' station.

Although the nurses were generally satisfied with the design of the central nurses' station, they did note that the station could be fairly loud. Talking, phones ringing, call bells and alarms all contribute to the noise. While these sounds may be necessary, the resulting volume contributes to a less than ideal work environment: noise has been found to increase stress by raising blood pressure and heart rate (Baker, 1992; Morrison et al., 2003; Topf & Thompson, 2001), as well as being a major cause of sleep deprivation (Parthasarathy & Tobin, 2004; Gabor et al., 2003; Topf & Thompson, 2001; Meyer et al., 1994). Nurses' stations can be distributed to reduce the number of people affected by noise source such as phone calls, and noise can be reduced by using sound absorbing ceiling panels in the nurses' station (Blomkvist, V., Eriksen, C. A., Theorell, T., Ulrich, R. S., & Rasmanis, G., 2005)

Distributed Nursing Substations

The distributed nursing stations located outside of the patients' rooms serve as small offices for nurses, and provide a place for them to complete charting and other work while remaining near their patients. One advantage of this design is that nurses' at the substations are able to monitor patient activity through two windows that provide a view into the neighboring rooms.

Both nurses and family members generally appreciated this design, with nurses saying: "I like a computer and two windows in the pod" and "[having] supplies at the pod cuts down on walking." Family members commented that: "Nurses can keep an eye on patients [with this design]."

During the tracking portion of their work, researchers found that the design did keep nurses in close contact with patients, as nurses spent 8 hours, 23 minutes in a 24-hour period at their substation. Because the unit's policy does not allow for family members to be in the halls of the ICU, the nursing station allowed nurses to work without interruption. However, family members would sometimes enter the hallway in an attempt to talk with the nurse assigned to their family member (7 minutes of the 8 hours that a nurse spent at the substation was spent talking to family.) This may indicate that family members do not feel that they are getting enough information from nurses. It may be possible to move charting functions into the patient room in order to increase communication between families and staff.

While the behavioral mapping survey concluded that a large number of interactions between staff members occurred at these substations, there was no evidence of interaction between nurses located at different substations—the distance and limited visibility between nurses meant that they would have to walk over to another nurse's station in order to communicate. Nurses were concerned about the fact that when they are in a patient room and need immediate assistance from another staff member, it is difficult to get someone's attention without leaving the room. The call button located on the patient bed is often difficult to reach if a nurse is assisting a patient and needs immediate support from a co-worker. Nurses also mentioned feeling slightly isolated in their substations. Perhaps some technological solutions could be utilized in order to facilitate communication between nurses' substations and patient rooms.

Other Support Areas

Because of the requirements of their job, nurses who staff critical care areas are often unable to leave the unit for more than a few minutes. Thus, the on-unit break areas are particularly important for them. Here, the MCG 3-West Unit has some room for improvement. One of the concerns was that the break room did not offer a window, or a view to the outside. One nurse said: "I just want a small, nice coffee break area for my 30 minute break." Additional, nurses feel uncomfortable going into the break room to get their lunch if a meeting is in progress and they are often disturbed during their breaks to assist with patients. The break room is very small and is intended to support several types of activities, including eating, relaxing, and meeting. Future renovation projects must consider how to better support these various functions.

Many nurses change clothes at the beginning or end of their shift. The MCG 3-West staff bathrooms do not have any place to hang clothes hangers, and the break room lacks storage for bags (and locker storage is not convenient for the nurses); therefore, the clothes and bags are often left unsecured at the distributed nurses' stations and in the nurses' break room.

Nurses also mentioned that they felt they could use a greater number of specialized rooms in the unit. "We need more med and linen rooms on the floor." And "We need rooms for different groups: the neurology group, medical students, nursing students..." were typical statements.

Both the Loma Linda University Medical Center in Loma Linda, California and the Harris Methodist Fort Worth Hospital in Fort Worth, Texas have solved the problem of access to storage rooms by using central corridors that allow nurses across the units easy access to medical supplies and linen storage. These distributed support areas save time while reducing nurses' walking distance and traffic through the unit. Using a similar design in future MCG renovations may be a useful design choice.

Conclusions

The family-oriented patient rooms in the 3-West project are generally larger than those in other critical care units across the country, and appear to be at the front of a trend towards more spacious patient rooms. The provision for a separate family area in patient rooms also places the unit in the vanguard of a national trend in hospital design. These rooms ultimately allow family members to be more involved with patient care, which leads to increased family satisfaction and decreased stress. These private areas also allow family members to establish a modicum of normalcy in an otherwise hectic and hostile situation. However, family members generally desire other design changes that will increase their comfort. Most of these design changes are small, and could be done without undue cost or hardship.

The other major design decision in the 3-West Project was the use of distributed nursing stations paired with a larger central nursing station. This choice, too, seems to be a success on a variety of metrics. The nursing turnover rate is lower in the N-ICU than in comparable units (although perhaps not statistically significant), and interviews with nurses suggest that they generally enjoy the stations, which provide a quiet and comfortable environment to complete their charting, monitor patients and collaborate with colleagues. Moreover, the design of the unit means that nurses spend 70% of their time near patients (either in the patient room, or immediately outside in the nursing station). However, the design of the nurses' stations also provide some opportunities for improvement. While many improvements are small-scale projects, some larger design changes may be incorporated in subsequent unit renovations.

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